Local Government Energy Audit:
Energy Audit Report

Herbertsville Elementary School

Brick Township Board of Education

2282 Lanes Mill Road
Brick, NJ 08724

April 17, 2018

Final Report by:
TRC Energy Services

Disclaimer

The intent of this energy analysis report is to identify energy savings opportunities and recommend upgrades to the facility's energy using equipment and systems. Approximate savings are included in this report to help make decisions about reducing energy use at the facility. This report, however, is not intended to serve as a detailed engineering design document. Further design and analysis may be necessary in order to implement some of the measures recommended in this report.

The energy conservation measures and estimates of energy savings have been reviewed for technical accuracy. However, estimates of final energy savings are not guaranteed, because final savings may depend on behavioral factors and other uncontrollable variables. TRC Energy Services (TRC) and New Jersey Board of Public Utilities (NJBPU) shall in no event be liable should the actual energy savings vary.

Estimated installation costs are based on TRC's experience at similar facilities, pricing from local contractors and vendors, and/or cost estimates from *RS Means*. The owner of the facility is encouraged to independently confirm these cost estimates and to obtain multiple estimates when considering measure installations. Since actual installed costs can vary widely for certain measures and conditions, TRC and NJBPU do not guarantee installed cost estimates and shall in no event be held liable should actual installed costs vary from estimates.

New Jersey's Clean Energy Program (NJCEP) incentive values provided in this report are estimates based on program information available at the time of the report. Incentive levels are not guaranteed. The NJBPU reserves the right to extend, modify, or terminate programs without prior notice. The owner of the facility should review available program incentives and eligibility requirements prior to selecting and installing any energy conservation measures.

Table of Contents

Table of Figures

1 Executive Summary

The New Jersey Board of Public Utilities (NJBPU) has sponsored this Local Government Energy Audit (LGEA) Report for Herbertsville Elementary School.

The goal of an LGEA report is to provide you with information on how your facility uses energy, identify energy conservation measures (ECMs) that can reduce your energy use, and provide information and assistance to help facilities implement ECMs. The LGEA report also contains valuable information on financial incentives from New Jersey's Clean Energy Program (NJCEP) for implementing ECMs.

This study was conducted by TRC Energy Services (TRC), as part of a comprehensive effort to assist New Jersey school districts in controlling energy costs and protecting our environment by offering a wide range of energy management options and advice.

1.1 Facility Summary

Herbertsville Elementary School is a one-story building totaling 26,924 square feet and was originally built in 1949. It has a flat roof and exterior walls are finished with concrete block construction with a painted stucco finish. Interior lighting consists mainly of linear T8 fluorescent fixtures and lamps. Heating is provided by four small hot water boilers. The cooling system consists of window air conditioner (AC) units, ductless mini-split heat pump, and packaged units. A thorough description of the facility and our observations are located in Section 2.

1.2 Your Cost Reduction Opportunities

Energy Conservation Measures

TRC evaluated 10 measures including seven high priority measures which together represent an opportunity for Herbertsville Elementary School to reduce annual energy costs by $9,309 and annual greenhouse gas emissions by 80,081 lbs CO_2e. We estimate that if all measures were implemented as recommended, the project would pay for itself in 7.3 years. The breakdown of existing and potential utility costs after project implementation are illustrated in Figure 1 and Figure 2, respectively. Together these measures represent an opportunity to reduce Herbertsville Elementary School's annual energy use by 13%.

Figure 1 – Previous 12 Month Utility Costs

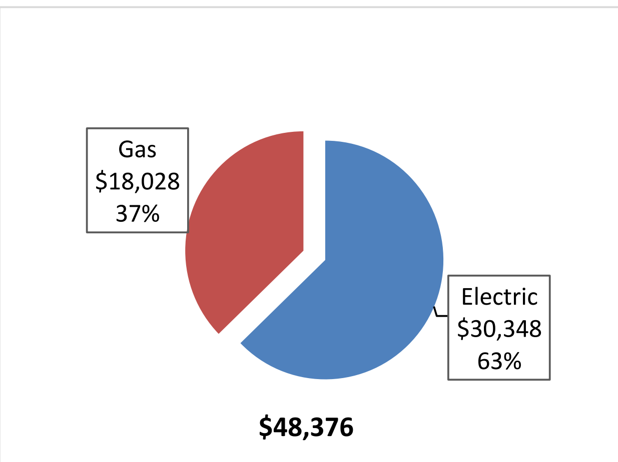
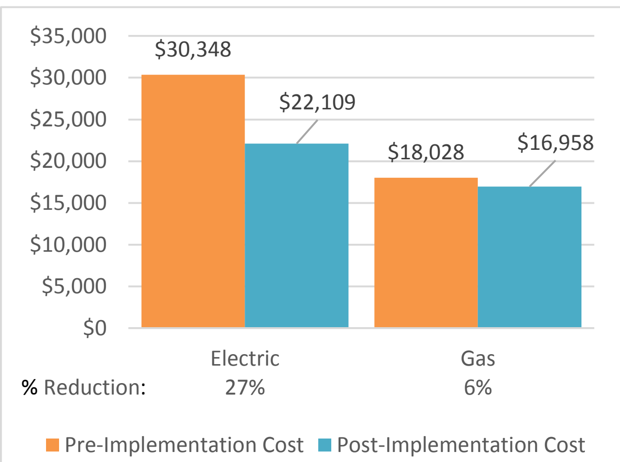


Figure 2 – Potential Post-Implementation Costs



A detailed description of Herbertsville Elementary School's existing energy use can be found in Section 3.

Estimates of the total cost, energy savings, and financial incentives for the proposed energy efficient upgrades are summarized below in Figure 3. A brief description of each category can be found below and a description of savings opportunities can be found in Section 4.

Figure 3 – Summary of Energy Reduction Opportunities

Energy Conservation Measure		Recommend?	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades			**52,762**	**9.9**	**0.0**	**$6,485.77**	**$26,325.58**	**$4,830.00**	**$21,495.58**	**3.3**	**53,131**
ECM 1	Install LED Fixtures	Yes	15,715	2.0	0.0	$1,931.81	$5,078.80	$1,300.00	$3,778.80	2.0	15,825
ECM 2	Retrofit Fixtures with LED Lamps	Yes	36,080	7.8	0.0	$4,435.08	$19,956.12	$3,530.00	$16,426.12	3.7	36,332
ECM 3	Install LED Exit Signs	Yes	967	0.1	0.0	$118.88	$1,290.66	$0.00	$1,290.66	10.9	974
Lighting Control Measures			**8,030**	**1.7**	**0.0**	**$987.03**	**$3,956.00**	**$550.00**	**$3,406.00**	**3.5**	**8,086**
ECM 4	Install Occupancy Sensor Lighting Controls	Yes	7,290	1.6	0.0	$896.12	$3,556.00	$550.00	$3,006.00	3.4	7,341
ECM 5	Install High/Low Lighitng Controls	Yes	740	0.2	0.0	$90.91	$400.00	$0.00	$400.00	4.4	745
Motor Upgrades			**528**	**0.3**	**0.0**	**$64.89**	**$532.17**	**$0.00**	**$532.17**	**8.2**	**532**
ECM 6	Premium Efficiency Motors	Yes	528	0.3	0.0	$64.89	$532.17	$0.00	$532.17	8.2	532
Electric Unitary HVAC Measures			**5,706**	**3.8**	**0.0**	**$701.43**	**$19,784.82**	**$736.00**	**$19,048.82**	**27.2**	**5,746**
	Install High Efficiency Electric AC	No	5,706	3.8	0.0	$701.43	$19,784.82	$736.00	$19,048.82	27.2	5,746
Gas Heating (HVAC/Process) Replacement			**0**	**0.0**	**91.1**	**$906.69**	**$26,124.68**	**$2,912.00**	**$23,212.68**	**25.6**	**10,663**
	Install High Efficiency Hot Water Boilers	No	0	0.0	77.7	$773.47	$23,043.29	$2,112.00	$20,931.29	27.1	9,097
	Install High Efficiency Furnaces	No	0	0.0	13.4	$133.22	$3,081.40	$800.00	$2,281.40	17.1	1,567
Domestic Water Heating Upgrade			**0**	**0.0**	**16.4**	**$163.46**	**$107.55**	**$0.00**	**$107.55**	**0.7**	**1,922**
ECM 7	Install Low-Flow Domestic Hot Water Devices	Yes	0	0.0	16.4	$163.46	$107.55	$0.00	$107.55	0.7	1,922
TOTALS FOR ALL PROPOSED MEASURES			**61,320**	**11.9**	**16.4**	**$7,701.16**	**$30,921.30**	**$5,380.00**	**$25,541.30**	**3.3**	**63,671**
TOTALS FOR ALL MEASURES			**67,026**	**15.7**	**107.5**	**$9,309.28**	**$76,830.80**	**$9,028.00**	**$67,802.80**	**7.3**	**80,081**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Lighting Upgrades generally involve the replacement of existing lighting components such as lamps and ballasts (or the entire fixture) with higher efficiency lighting components. These measure save energy by reducing the power used by the lighting components due to improved electrical efficiency.

Lighting Controls measures generally involve the installation of automated controls to turn off lights or reduce light output when not needed. Automated control reduces reliance on occupant behavior for adjusting lights. These measures save energy by reducing the amount of time lights are on.

Motor Upgrades generally involve replacing older standard efficiency motors with high efficiency standard (NEMA Premium). Motors replacements generally assume the same size motors, just higher efficiency. Although occasionally additional savings can be achieved by downsizing motors to better meet current load requirements. This measure saves energy by reducing the power used by the motors, due to improved electrical efficiency.

Electric Unitary HVAC measures generally involve replacing older inefficient air conditioning systems with modern energy efficient systems. New air conditioning systems can provide equivalent cooling to older air condition systems at a reduced energy cost. These measures save energy by reducing the power used by the air conditioning systems, due to improved electrical efficiency.

Gas Heating (HVAC/Process) measures generally involve replacing older inefficient hydronic heating systems with modern energy efficient systems. Gas heating systems can provide equivalent heating compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel demands for heating, due to improved combustion and heat transfer efficiency.

Domestic Hot Water upgrade measures generally involve replacing older inefficient domestic water heating systems with modern energy efficient systems. New domestic hot water heating systems can provide equivalent, or greater, water heating capacity compared to older systems at a reduced energy cost. These measures save energy by reducing the fuel used for domestic hot water heating due to improved heating efficiency or reducing standby losses.

Energy Efficient Best Practices

TRC also identified 15 low cost or no cost energy efficient best practices. A facility's energy performance can be significantly improved by employing certain behavioral or operational adjustments and by performing better routine maintenance on building systems. These best practices can extend equipment lifetime, improve occupant comfort, provide better health and safety, as well as reduce annual energy and O&M costs. It is our understanding Brick Township Board of Education is already implementing many of the best practices described in the audit reports, however they are listed for representative purposes only.

- Close Doors and Windows
- Perform Proper Lighting Maintenance
- Develop a Lighting Maintenance Schedule
- Ensure Lighting Controls Are Operating Properly
- Turn Off Unneeded Motors
- Perform Routine Motor Maintenance
- Practice Proper Use of Thermostat Schedules and Temperature Resets
- Ensure Economizers are Functioning Properly
- Clean Evaporator/Condenser Coils on AC Systems
- Clean and/or Replace HVAC Filters
- Check for and Seal Duct Leakage
- Perform Proper Boiler Maintenance
- Perform Proper Water Heater Maintenance
- Install Plug Load Controls
- Water Conservation

For details on these energy efficient best practices, please refer to Section 5.

On-Site Generation Measures

TRC evaluated the potential for installing on-site generation for Herbertsville Elementary School. Although Brick Township Board of Education implemented a solar energy project in 2017 and already evaluated each school building, TRC still performed an analysis to determine the potential for installing solar at these sites as part of the LGEA program's scope of audit services. Based on the configuration of the site and its loads there is a high potential for installing a photovoltaic (PV) array.

Figure 4 – Estimated costs and benefits for a 80 kW PV Arrays

Total Installed Cost	$280,000	$
Value of Electric Generation per Year	$10,565	$
Annual Income from SRECS	$19,975	$
Total Economic Value per Year	$30,540	$
Simple Payback Period	9.17	years

For details on our evaluation and on-site generation potential, please refer to Section 6.

1.3 Implementation Planning

To realize the energy savings from the ECMs listed in this report, a project implementation plan must be developed. Available capital must be considered and decisions need to be made whether it is best to pursue individual ECMs separately, groups of ECMs, or a comprehensive approach where all ECMs are implemented together, possibly in conjunction with other facility upgrades or improvements.

Rebates, incentives, and financing are available from NJCEP, as well as other sources, to help reduce the costs associated with the implementation of energy efficiency projects. Prior to implementing any measure, please review the relevant incentive program guidelines before proceeding. This is important because in most cases you will need to submit applications for the incentives prior to purchasing materials or commencing with installation.

The ECMs outlined in this report may qualify under the following program(s):

- SmartStart
- Direct Install
- Energy Savings Improvement Program

For facilities wanting to pursue only selected individual measures (or planning to phase implementation of selected measures over multiple years), incentives are available through the SmartStart program. To participate in this program you may utilize internal resources, or an outside firm or contractor, to do the final design of the ECM(s) and do the installation. Program pre-approval is required for some SmartStart incentives, so only after receiving pre-approval should you proceed with ECM installation. The incentive estimates listed above in Figure 3 are based on the SmartStart program. More details on this program and others are available in Section 8.

This facility may also qualify for the Direct Install program which can provide turnkey installation of multiple measures, through an authorized network of participating contractors. This program can provide substantially higher incentives that SmartStart, up to 70% of the cost of selected measures, although measure eligibility will have to be assessed and be verified by the designated Direct Install contractor and, in most cases, they will perform the installation work.

For larger facilities with limited capital availability to implement ECMs, project financing may be available through the Energy Savings Improvement Program (ESIP). Supported directly by the NJBPU, ESIP provides government agencies with project development, design, and implementation support services, as well as, attractive financing for implementing ECMs. An LGEA report (or other approved energy audit) is required for participation in ESIP. Please refer to Section 8.4 for additional information on the ESIP Program.

Additional information on relevant incentive programs is located in Section 8 or: www.njcleanenergy.com/ci.

2 Facility Information and Existing Conditions

2.1 Project Contacts

Figure 5 – Project Contacts

Name	Role	E-Mail	Phone #
Customer			
James W. Edwards, Jr.	Business Administrator/Board Secretary	jedwards@brickschools.org	732 785-3000
Designated Representative			
Bryan Hubert	Head Custodian		732 785-3000 Ext. 4502
TRC Energy Services			
Moussa Traore	Auditor	mtraore@trcsolutions.com	(732) 855-0033

2.2 General Site Information

On February 16, 2017, TRC performed an energy audit at Herbertsville Elementary School located in Brick, New Jersey. TRC's auditor met with Bryan Hubert to review the facility operations and help focus our investigation on specific energy-using systems.

The 26,924 square foot elementary school building is a one-story facility and is comprised of classrooms, gymnasium, kitchen, administrative offices, library, and mechanical spaces. It was originally built in 1949 and received two additions in 1998 and 2002. In 1998, classrooms and a gymnasium were added. In 2002, additional classrooms and the library were constructed.

2.3 Building Occupancy

The school operates on a 10 month schedule and is open Monday through Friday. The typical schedule is presented in the table below. During a typical day, the school is occupied by approximately 224 students and 40 staff

Figure 6 - Building Schedule

Building Name	Weekday/Weekend	Operating Schedule
Herbertsville Elementary School	Weekday	6:30 AM - 5:30 PM
Herbertsville Elementary School	Weekend	Closed

2.4 Building Envelope

The building has a flat, built-up roof covered with black membrane and light white stone that appeared to be in good condition. Exterior walls are finished with concrete block construction with a painted stucco finish. Typical windows throughout the building are double pane, operable clear glass with aluminum frames. They are in good condition and well maintained. Exterior doors are constructed of metal.

2.5 On-Site Generation

Herbertsville Elementary School does not currently have any on-site electric generation capacity.

2.6 Energy-Using Systems

Please see Appendix A: Equipment Inventory & Recommendations for an inventory of the facility's equipment.

<u>Lighting System</u>

Interior lighting at the facility is provided mostly by 32-Watt linear fluorescent T8 lamps with electronic ballasts. Most of the linear fluorescent fixtures are 4-foot long with one or two lamps. Exit signs throughout the building are incandescent lamps. Interior lighting control is provided mainly by manual wall switches. The building also has exterior lighting which consists of metal halide and two LED outdoor wall mounted area fixtures. They are controlled with photocells.

<u>Hot Water Heating System</u>

The building heating systems vary with the construction era of the facility. The original building is heated by two Lochinvar condensing hot water boilers. They are three years old and have an output capacity of 467 MBh each, with a nominal combustion efficiency of 93%. They are located in Boiler Room 1. Heating hot water is distributed to the unit ventilators, convectors and fin tube radiators located throughout the classrooms, offices, and toilet rooms in the original building via two 1 hp pumps also located in Boiler Room 1. Pumps run at a constant speed. The boilers are configured in a constant flow distribution and have a full-modulation sequencing control system.

The 1998 addition is heated by a heating plant located in Boiler Room 2 adjacent to the gymnasium. It consists of a bank of Hydrotherm gas-fired modular boilers with a total output capacity of 960 MBh and a combustion efficiency of 80%. Heating hot water is circulated throughout the 1998 section by one 2 hp constant flow pump also located in Boiler Room 2. The boilers are approximately 19 years old and appeared in fair condition and are controlled via a boiler control panel located near the boiler. An outdoor small gas-fired Raypack boiler located on the roof level serves the 2002 addition. This boiler has a total output capacity of 144 MBh and an estimated efficiency of 80%. It appeared to be in good condition.

Direct Expansion Air Conditioning System (DX)

Four 2-ton ductless mini-split heat pumps, five window air conditioner units, and five rooftop packaged units are used to condition the building. The split heat pumps are two years old and are in good condition. The window AC units also appeared to be in good condition except one serving room #3. One 3 ton York packaged heat pump serves the kitchen. The unit is two years old. Two 15 ton York rooftop packaged cooling only units are used to condition the gymnasium. They are two years old and appeared to be in good condition. The speech room and the library have one 3 ton (RTU2) and one 5 ton (RTU1) AAON packaged rooftop unit respectively. They have 56 and 80 MBh output capacity gas fired heating section respectively. The units are 15 years old and appeared to be in fair condition. Air is exhausted in common areas through roof-mounted exhaust fans. Thermostats are used for temperature control.

Domestic Hot Water Heating System

Domestic hot water is provided by a two year old Bradford White gas-fired non-condensing water heater with an input rating of 125 MBh and a nominal efficiency of 80%, and a three year old Bradford White electric water heater with an input capacity of 4.5 kW. The water heater storage tank capacities are 60 and 30 gallons respectively and are located in the boiler rooms. They appeared to be in good condition.

Food Service & Refrigeration

The school houses a small institutional kitchen. The kitchen includes three gas insulated food holding cabinets, one stand-up refrigerator and one refrigerator chest. The kitchen is well maintained.

Building Plug Load

There are approximately 57 computer work stations throughout the facility and they are mostly desktop units with LCD monitors. There is no centralized PC power management software installed.

2.7 Water-Using Systems

There are several restrooms at this facility. A sampling of restrooms found that faucets are rated for 2 gallons per minute (gpm) or higher, the toilets are rated at 2.5 gallons per flush (gpf) and the urinals are rated at 2 gpf. The kitchen has two faucets that are rated for 3 gpm. There are two restrooms with showers.

3 SITE ENERGY USE AND COSTS

Utility data for electricity and natural gas was analyzed to identify opportunities for savings. In addition, data for electricity and natural gas was evaluated to determine the annual energy performance metrics for the building in energy cost per square foot and energy usage per square foot. These metrics are an estimate of the relative energy efficiency of this building. There are a number of factors that could cause the energy use of this building to vary from the "typical" energy usage profile for facilities with similar characteristics. Local weather conditions, building age and insulation levels, equipment efficiency, daily occupancy hours, changes in occupancy throughout the year, equipment operating hours, and energy efficient behavior of occupants all contribute to benchmarking scores. Please refer to the Benchmarking section within Section 3.4 for additional information.

3.1 Total Cost of Energy

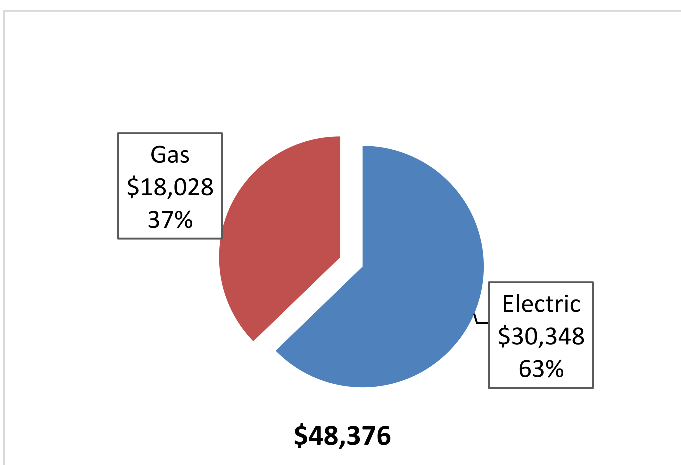
The following energy consumption and cost data is based on the last 12-month period of utility billing data that was provided for each utility. A profile of the annual energy consumption and energy cost of the facility was developed from this information.

Figure 7 - Utility Summary

Utility Summary for Herbertsville Elementary School		
Fuel	**Usage**	**Cost**
Electricity	246,883 kWh	$30,348
Natural Gas	18,108 Therms	$18,028
Total		**$48,376**

The current annual energy cost for this facility is $48,376 as shown in the chart below.

Figure 8 - Energy Cost Breakdown



3.2 Electricity Usage

Electricity is provided by JCP&L. The average electric cost over the past 12 months was $0.123/kWh, which is the blended rate that includes energy supply, distribution, and other charges. This rate is used throughout the analyses in this report to assess energy costs and savings. The electricity profile indicates a moderate reduction of summer use consistent with a reduced use of the site during summer months, followed by increased usage during warmer months when school is back in session. The monthly electricity consumption and peak demand are shown in the chart below.

Figure 9 - Electric Usage & Demand

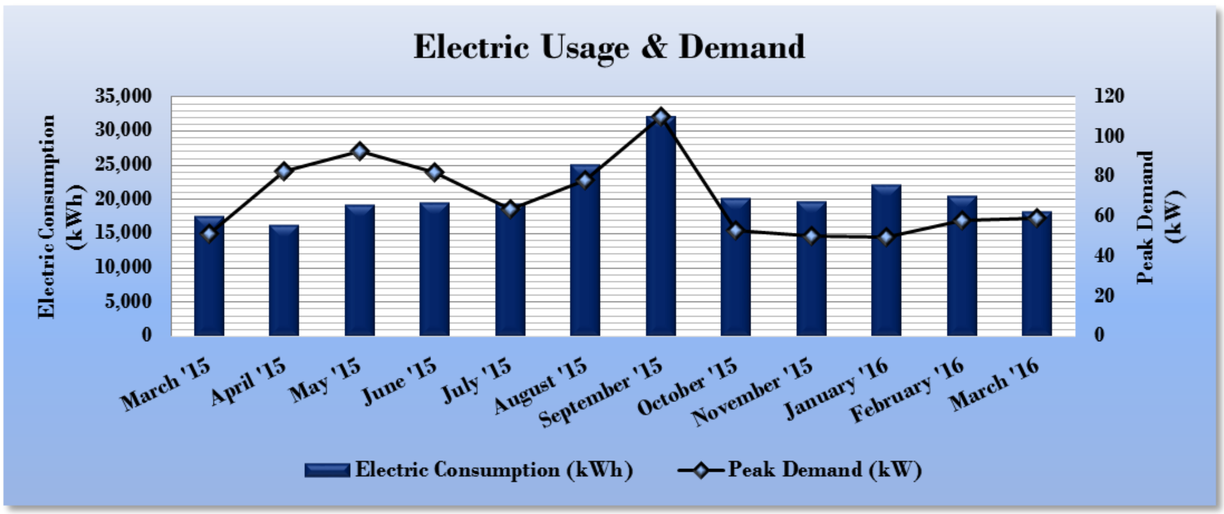


Figure 10 - Electric Usage & Demand

Electric Billing Data for Herbertsville Elementary School					
Period Ending	Days in Period	Electric Usage (kWh)	Demand (kW)	Demand Cost	Total Electric Cost
4/15/15	34	17,566	52	$242	$2,143
5/15/15	29	16,278	83	$100	$2,145
6/15/15	31	19,133	93	$110	$2,515
7/16/15	31	19,569	82	$78	$2,442
8/14/15	29	19,345	64	$91	$2,379
9/16/15	33	25,061	78	$94	$3,008
10/15/15	29	32,004	110	$248	$3,803
11/16/15	32	20,209	53	$196	$2,384
12/15/15	29	19,652	50	$196	$2,324
1/18/16	34	22,122	50	$200	$2,568
2/16/16	29	20,476	58	$79	$2,411
3/16/16	29	18,174	59	$86	$2,558
Totals	**369**	**249,589**	**109.9**	**$1,720**	**$30,681**
Annual	**365**	**246,883**	**109.9**	**$1,702**	**$30,348**

3.3 Natural Gas Usage

Natural gas is provided by NJ Natural Gas. The average gas cost for the past 12 months is $0.996/therm, which is the blended rate used throughout the analyses in this report. Natural gas use follows a typical heating profile. The monthly gas consumption is shown in the chart below.

Figure 11 - Natural Gas Usage

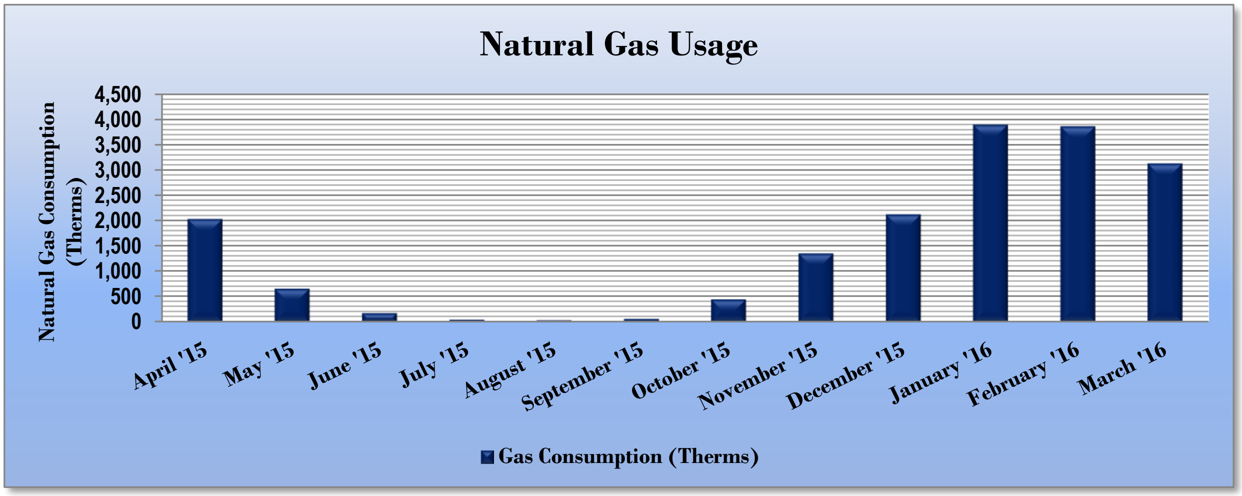


Figure 12 - Natural Gas Usage

Gas Billing Data for Herbertsville Elementary School			
Period Ending	Days in Period	Natural Gas Usage (Therms)	Natural Gas Cost
4/21/15	31	2,030	$1,971
5/21/15	32	656	$834
6/16/15	27	172	$430
7/23/15	30	40	$323
8/18/15	27	31	$258
9/17/15	31	56	$336
10/16/15	31	441	$640
11/17/15	31	1,351	$1,358
12/19/15	30	2,118	$1,982
1/22/16	29	3,888	$3,396
2/19/16	28	3,856	$3,370
3/22/16	31	3,123	$2,785
Totals	**358**	**17,761**	**$17,682**
Annual	**365**	**18,108**	**$18,028**

3.4 Benchmarking

This facility was benchmarked using Portfolio Manager, an online tool created and managed by the United States Environmental Protection Agency (EPA) through the ENERGY STAR® program. Portfolio Manager analyzes your building's consumption data, cost information, and operational use details and then compares its performance against a national median for similar buildings of its type. Metrics provided by this analysis are Energy Use Intensity (EUI) and an ENERGY STAR® score for select building types.

The EUI is a measure of a facility's energy consumption per square foot, and it is the standard metric for comparing buildings' energy performance. Comparing the EUI of a building with the national median EUI for that building type illustrates whether that building uses more or less energy than similar buildings of its type on a square foot basis. EUI is presented in terms of "site energy" and "source energy." Site energy is the amount of fuel and electricity consumed by a building as reflected in utility bills. Source energy includes fuel consumed to generate electricity consumed at the site, factoring in electric production and distribution losses for the region.

Figure 13 - Energy Use Intensity Comparison – Existing Conditions

Energy Use Intensity Comparison - Existing Conditions		
	Herbertsville Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	168.9	141.4
Site Energy Use Intensity (kBtu/ft^2)	98.5	58.2

Implementation of all recommended measures in this report would improve the building's estimated EUI significantly, as shown in the table below:

Figure 14 - Energy Use Intensity Comparison – Following Installation of Recommended Measures

Energy Use Intensity Comparison - Following Installation of Recommended Measures		
	Herbertsville Elementary School	National Median Building Type: School (K-12)
Source Energy Use Intensity (kBtu/ft^2)	143.8	141.4
Site Energy Use Intensity (kBtu/ft^2)	90.2	58.2

Many types of commercial buildings are also eligible to receive an ENERGY STAR® score. This score is a percentile ranking from 1 to 100. It compares your building's energy performance to similar buildings nationwide. A score of 50 represents median energy performance, while a score of 75 means your building performs better than 75 percent of all similar buildings nationwide and may be eligible for ENERGY STAR® certification. Herbertsville Elementary School building was benchmarked along with its annex as they shared the total thermal load. This facility along with the annex building have a current score of 28.

A Portfolio Manager Statement of Energy Performance (SEP) was generated for this facility, see Appendix B: ENERGY STAR® Statement of Energy Performance.

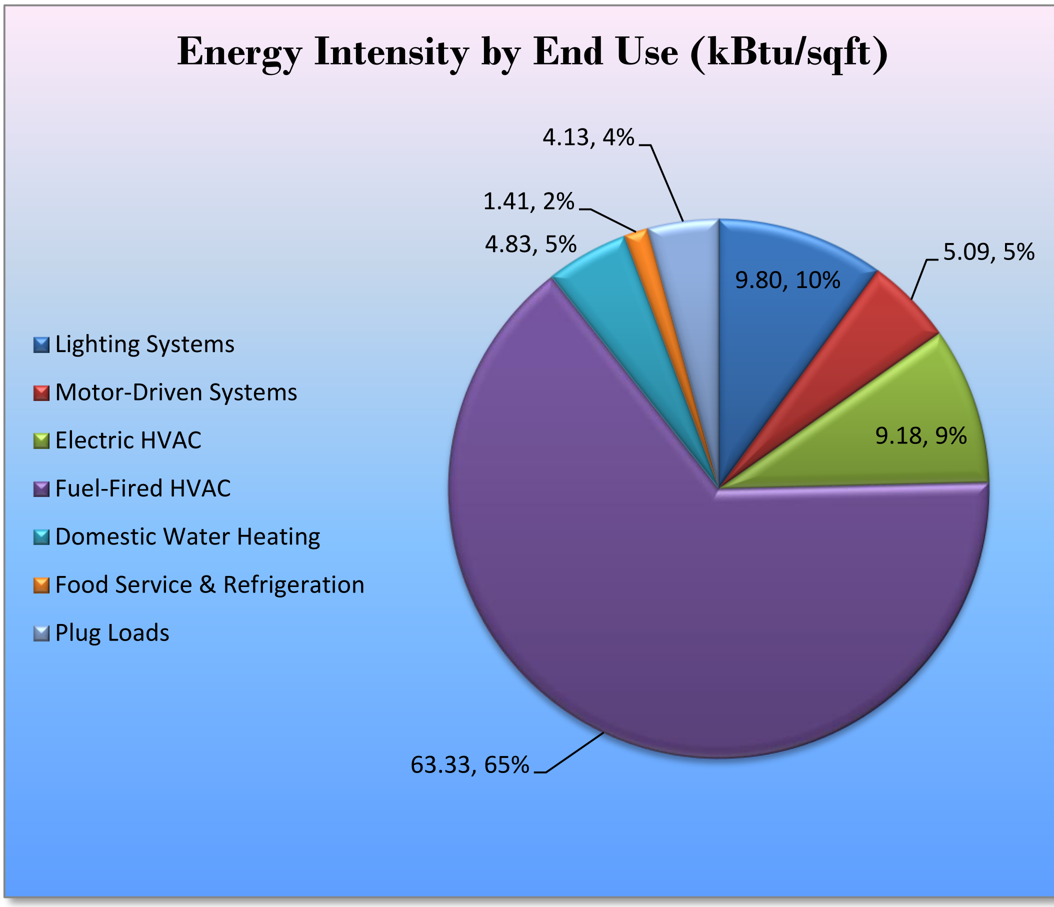
For more information on ENERGY STAR® certification go to: https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/earn-recognition/energy-star-certification/how-app-1.

A Portfolio Manager account has been created online for your facility and you will be provided with the login information for the account. We encourage you to update your utility information in Portfolio Manager regularly, so that you can keep track of your building's performance. Free online training is available to help you use ENERGY STAR® Portfolio Manager to track your building's performance at: https://www.energystar.gov/buildings/training.

3.5 Energy End-Use Breakdown

In order to provide a complete overview of energy consumption across building systems, an energy balance was performed at this facility. An energy balance utilizes standard practice engineering methods to evaluate all components of the various electric and fuel-fired systems found in a building to determine their proportional contribution to overall building energy usage. This chart of energy end uses highlights the relative contribution of each equipment category to total energy usage. This can help determine where the greatest benefits might be found from energy efficiency measures.

Figure 15 - Energy Balance (% and kBtu/SF)



4 Energy Conservation Measures

Level of Analysis

The goal of this audit report is to identify potential energy efficiency opportunities, help prioritize specific measures for implementation, and provide information to the Herbertsville Elementary School regarding financial incentives for which they may qualify to implement the recommended measures. For this audit report, most measures have received only a preliminary analysis of feasibility which identifies expected ranges of savings and costs. This level of analysis is usually considered sufficient to demonstrate project cost-effectiveness and help prioritize energy measures. Savings are based on the New Jersey Clean Energy Program Protocols to Measure Resource Savings dated June 29, 2016, approved by the New Jersey Board of Public Utilities. Further analysis or investigation may be required to calculate more precise savings based on specific circumstances. A higher level of investigation may be necessary to support any custom SmartStart or Pay for Performance, or Direct Install incentive applications. Financial incentives for the ECMs identified in this report have been calculated based the NJCEP prescriptive SmartStart program. Some measures and proposed upgrade projects may be eligible for higher incentives than those shown below through other NJCEP programs as described in Section 8.

The following sections describe the evaluated measures.

4.1 Recommended ECMs

The measures below have been evaluated by the auditor and are recommended for implementation at the facility.

Figure 16 – Summary of Recommended ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**52,762**	**9.9**	**0.0**	**$6,485.77**	**$26,325.58**	**$4,830.00**	**$21,495.58**	**3.3**	**53,131**
ECM 1	Install LED Fixtures	15,715	2.0	0.0	$1,931.81	$5,078.80	$1,300.00	$3,778.80	2.0	15,825
ECM 2	Retrofit Fixtures with LED Lamps	36,080	7.8	0.0	$4,435.08	$19,956.12	$3,530.00	$16,426.12	3.7	36,332
ECM 3	Install LED Exit Signs	967	0.1	0.0	$118.88	$1,290.66	$0.00	$1,290.66	10.9	974
Lighting Control Measures		**8,030**	**1.7**	**0.0**	**$987.03**	**$3,956.00**	**$550.00**	**$3,406.00**	**3.5**	**8,086**
ECM 4	Install Occupancy Sensor Lighting Controls	7,290	1.6	0.0	$896.12	$3,556.00	$550.00	$3,006.00	3.4	7,341
ECM 5	Install High/Low Lighitng Controls	740	0.2	0.0	$90.91	$400.00	$0.00	$400.00	4.4	745
Motor Upgrades		**528**	**0.3**	**0.0**	**$64.89**	**$532.17**	**$0.00**	**$532.17**	**8.2**	**532**
ECM 6	Premium Efficiency Motors	528	0.3	0.0	$64.89	$532.17	$0.00	$532.17	8.2	532
Domestic Water Heating Upgrade		**0**	**0.0**	**16.4**	**$163.46**	**$107.55**	**$0.00**	**$107.55**	**0.7**	**1,922**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	16.4	$163.46	$107.55	$0.00	$107.55	0.7	1,922
TOTALS		**61,320**	**11.9**	**16.4**	**$7,701.16**	**$30,921.30**	**$5,380.00**	**$25,541.30**	**3.3**	**63,671**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

4.1.1 Lighting Upgrades

Recommended upgrades to existing lighting fixtures are summarized in Figure 17 below.

Figure 17 – Summary of Lighting Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Upgrades		**52,762**	**9.9**	**0.0**	**$6,485.77**	**$26,325.58**	**$4,830.00**	**$21,495.58**	**3.3**	**53,131**
ECM 1	Install LED Fixtures	15,715	2.0	0.0	$1,931.81	$5,078.80	$1,300.00	$3,778.80	2.0	15,825
ECM 2	Retrofit Fixtures with LED Lamps	36,080	7.8	0.0	$4,435.08	$19,956.12	$3,530.00	$16,426.12	3.7	36,332
ECM 3	Install LED Exit Signs	967	0.1	0.0	$118.88	$1,290.66	$0.00	$1,290.66	10.9	974

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 1: Install LED Fixtures

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0
Exterior	15,715	2.0	0.0	$1,931.81	$5,078.80	$1,300.00	$3,778.80	2.0	15,825

Measure Description

We recommend replacing existing fixtures containing metal halide lamps with new high performance LED light fixtures. This measure saves energy by installing LEDs which use less power than other technologies with a comparable light output.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 2: Retrofit Fixtures with LED Lamps

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	36,080	7.8	0.0	$4,435.08	$19,956.12	$3,530.00	$16,426.12	3.7	36,332
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend retrofitting existing compact fluorescent and linear T8 fluorescent lamps with LED lamps. Many LED tube lamps are direct replacements for existing fluorescent lamps and can be installed while leaving the fluorescent fixture ballast in place. LED bulbs can be used in existing fixtures as a direct replacement for most other lighting technologies. This measure saves energy by installing LEDs which use less power than other lighting technologies yet provide equivalent lighting output for the space.

Additional savings from lighting maintenance can be anticipated since LEDs have lifetimes which are more than twice that of a fluorescent tubes and more than 10 times longer than many incandescent lamps.

ECM 3: Install LED Exit Signs

Summary of Measure Economics

Interior/ Exterior	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Interior	967	0.1	0.0	$118.88	$1,290.66	$0.00	$1,290.66	10.9	974
Exterior	0	0.0	0.0	$0.00	$0.00	$0.00	$0.00	0.0	0

Measure Description

We recommend replacing all incandescent or compact fluorescent exit signs with LED exit signs. LED exit signs require virtually no maintenance and have a life expectancy of at least 20 years. This measure saves energy by installing LED fixtures, which use less power than other technologies with an equivalent lighting output.

4.1.2 Lighting Control Measures

Figure 18 – Summary of Lighting Control ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Lighting Control Measures		**8,030**	**1.7**	**0.0**	**$987.03**	**$3,956.00**	**$550.00**	**$3,406.00**	**3.5**	**8,086**
ECM 4	Install Occupancy Sensor Lighting Controls	7,290	1.6	0.0	$896.12	$3,556.00	$550.00	$3,006.00	3.4	7,341
ECM 5	Install High/Low Lighitng Controls	740	0.2	0.0	$90.91	$400.00	$0.00	$400.00	4.4	745

During lighting upgrade planning and design, we recommend a comprehensive approach that considers both the efficiency of the lighting fixtures and how they are controlled.

ECM 4: Install Occupancy Sensor Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
7,290	1.6	0.0	$896.12	$3,556.00	$550.00	$3,006.00	3.4	7,341

Measure Description

We recommend installing occupancy sensors to control lighting fixtures that are currently controlled by manual switches in classrooms, offices, gymnasium, and restrooms. Lighting sensors detect occupancy using ultrasonic and/or infrared sensors. For most spaces, we recommend lighting controls use dual technology sensors, which can eliminate the possibility of any lights turning off unexpectedly. Lighting systems are enabled when an occupant is detected. Fixtures are automatically turned off after an area has been vacant for a preset period. Some controls also provide dimming options and all modern occupancy controls can be easily over-ridden by room occupants to allow them to manually turn fixtures on or off, as desired. Energy savings results from only operating lighting systems when they are required.

Occupancy sensors may be mounted on the wall at existing switch locations, mounted on the ceiling, or in remote locations. In general, wall switch replacement sensors are recommended for single occupant offices and other small rooms. Ceiling-mounted or remote mounted sensors are used in locations without local switching or where wall switches are not in the line-of-sight of the main work area and in large spaces. We recommend a comprehensive approach to lighting design that upgrades both the lighting fixtures and the controls together for maximum energy savings and improved lighting for occupants.

ECM 5: Install High/Low Lighting Controls

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
740	0.2	0.0	$90.91	$400.00	$0.00	$400.00	4.4	745

Measure Description

We recommend installing occupancy sensors to provide dual level lighting control for lighting fixtures in spaces that are infrequently occupied but may require some level of continuous lighting for safety or security reasons. Typical areas for such lighting control are interior corridors.

Lighting fixtures with these controls operate at default low levels when the area is not occupied to provide minimal lighting to meet security or safety requirements. Sensors detect occupancy using ultrasonic and/or infrared sensors. The lighting systems are switched to full lighting levels whenever an occupant is detected. Fixtures are automatically switched back to low level after an area has been vacant for a preset period of time. Energy savings results from only providing full lighting levels when it is required.

For this type of measure the occupancy sensors will generally be ceiling or fixture mounted. Sufficient sensor coverage needs to be provided to ensure that lights turn on in each area as an occupant approaches.

Additional savings from reduced lighting maintenance may also result from this measure, due to reduced lamp operation.

4.1.3 Motor Upgrades

Our recommendations for motor upgrades are summarized in Figure 19 below.

Figure 19 – Summary of Motor Upgrade ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Motor Upgrades		**528**	**0.3**	**0.0**	**$64.89**	**$532.17**	**$0.00**	**$532.17**	**8.2**	**532**
ECM 6	Premium Efficiency Motors	528	0.3	0.0	$64.89	$532.17	$0.00	$532.17	8.2	532

ECM 6: Premium Efficiency Motors

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
528	0.3	0.0	$64.89	$532.17	$0.00	$532.17	8.2	532

Measure Description

We recommend replacing standard efficiency motors with *NEMA Premium™* efficiency motors. Our evaluation assumes that existing motors will be replaced with motors of equivalent size and type. Although occasionally additional savings can be achieved by downsizing motors to better meet the motor's current load requirements. The base case motor efficiencies are estimated from nameplate information and our best estimates of motor run hours. Efficiencies of proposed motor upgrades are obtained from the *New Jersey's Clean Energy Program Protocols to Measure Resource Savings (2016)*. Savings are based on the difference between baseline and proposed efficiencies and the assumed annual operating hours.

4.1.4 Domestic Hot Water Heating System Upgrades

Our recommendations for domestic water heating system improvements are summarized in Figure 20 below.

Figure 20 - Summary of Domestic Water Heating ECMs

Energy Conservation Measure		Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
Domestic Water Heating Upgrade		**0**	**0.0**	**16.4**	**$163.46**	**$107.55**	**$0.00**	**$107.55**	**0.7**	**1,922**
ECM 7	Install Low-Flow Domestic Hot Water Devices	0	0.0	16.4	$163.46	$107.55	$0.00	$107.55	0.7	1,922

ECM 7: Install Low-Flow DHW Devices

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	16.4	$163.46	$107.55	$0.00	$107.55	0.7	1,922

Measure Description

We recommend installing low-flow domestic hot water devices to reduce overall hot water demand. Energy demand from domestic hot water heating systems can be reduced by reducing water usage in general. Faucet aerators and low-flow can reduce hot water usage, relative to standard aerators, which saves energy. Low-flow devices reduce the overall water flow from the fixture, while still adequate pressure for washing. This reduces the amount of water used per day resulting in energy and water savings.

4.2 ECMs Evaluated But Not Recommended

The measures below have been evaluated by the auditor but are not recommended for implementation at the facility. Reasons for exclusion can be found in each measure description section.

Figure 21 – Summary of Measures Evaluated, But Not Recommended

Energy Conservation Measure	Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)*	Estimated Net Cost ($)	Simple Payback Period (yrs)**	CO_2e Emissions Reduction (lbs)
Electric Unitary HVAC Measures	**5,706**	**3.8**	**0.0**	**$701.43**	**$19,784.82**	**$736.00**	**$19,048.82**	**27.2**	**5,746**
Install High Efficiency Electric AC	5,706	3.8	0.0	$701.43	$19,784.82	$736.00	$19,048.82	27.2	5,746
Gas Heating (HVAC/Process) Replacement	**0**	**0.0**	**91.1**	**$906.69**	**$26,124.68**	**$2,912.00**	**$23,212.68**	**25.6**	**10,663**
Install High Efficiency Hot Water Boilers	0	0.0	77.7	$773.47	$23,043.29	$2,112.00	$20,931.29	27.1	9,097
Install High Efficiency Furnaces	0	0.0	13.4	$133.22	$3,081.40	$800.00	$2,281.40	17.1	1,567
TOTALS	**5,706**	**3.8**	**91.1**	**$1,608.12**	**$45,909.50**	**$3,648.00**	**$42,261.50**	**26.3**	**16,410**

* - All incentives presented in this table are based on NJ Smart Start Building equipment incentives and assume proposed equipment meets minimum performance criteria for that program.

** - Simple Payback Period is based on net measure costs (i.e. after incentives).

Install High Efficiency Air Conditioning Units

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
5,706	3.8	0.0	$701.43	$19,784.82	$736.00	$19,048.82	27.2	5,746

Measure Description

We recommend replacing standard efficiency packaged air conditioning units with high efficiency packaged air conditioning units. There have been significant improvements in both compressor and fan motor efficiencies over the past several years. Therefore, electricity savings can be achieved by replacing older units with new high efficiency units. A higher EER or SEER rating indicates a more efficient cooling system. The magnitude of energy savings for this measure depends on the relative efficiency of the older unit versus the new high efficiency unit, the average cooling load, and the estimated annual operating hours.

Reasons for not Recommending

The overall simple payback for this project is 27 years which is more than the recommended ten year threshold.

Install High Efficiency Hot Water Boilers

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	77.7	$773.47	$23,043.29	$2,112.00	$20,931.29	27.1	9,097

Measure Description

We recommend replacing older inefficient hot water boilers with high efficiency hot water boilers. Significant improvements have been made in combustion technology resulting in increased overall boiler efficiency. Energy savings results from improved combustion efficiency and reduced standby losses at low loads.

The most notable efficiency improvement is condensing hydronic boilers that can achieve over 90% efficiency under the proper conditions. Condensing hydronic boilers typically operate at efficiencies between 85% and 87% (comparable to other high efficiency boilers) when the return water temperature is above 130°F. The boiler efficiency increases as the return water temperature drops below 130 °F. Therefore, condensing hydronic boilers were only evaluated when the return water temperature is less than 130°F during most of the operating hours. As a result condensing hydronic boiler is recommended for this site.

Reasons for not Recommending

The simple payback for this project is 27 years, and therefore the measure is not recommended based on energy savings.

Install High Efficiency Furnaces

Summary of Measure Economics

Annual Electric Savings (kWh)	Peak Demand Savings (kW)	Annual Fuel Savings (MMBtu)	Annual Energy Cost Savings ($)	Estimated Install Cost ($)	Estimated Incentive ($)	Estimated Net Cost ($)	Simple Payback Period (yrs)	CO_2e Emissions Reduction (lbs)
0	0.0	13.4	$133.22	$3,081.40	$800.00	$2,281.40	17.1	1,567

Measure Description

We recommend replacing existing standard efficiency furnaces with condensing furnaces. Improved combustion technology and heat exchanger design optimize heat recovery from the combustion gases which can significantly improve furnace efficiency. Savings result from improved system efficiency.

Reasons for not Recommending

The overall simple payback for this project is 27 years which is more than the recommended 13 year threshold.

5 Energy Efficient Best Practices

In addition to the quantifiable savings estimated in Section 4, a facility's energy performance can also be improved through application of many low cost or no-cost energy efficiency strategies. By employing certain behavioral and operational changes and performing routine maintenance on building systems, equipment lifetime can be extended; occupant comfort, health and safety can be improved; and energy and O&M costs can be reduced. The recommendations below are provided as a framework for developing a whole building maintenance plan that is customized to your facility. The recommendations below are for informational purposes only and do not reflect actual efforts actively being performed by Brick Township Board of Education**.**

Close Doors and Windows

Ensure doors and windows are closed in conditioned spaces. Leaving doors and windows open leads to a significant increase in heat transfer between conditioned spaces and the outside air. Reducing a facility's air changes per hour (ACH) can lead to increased occupant comfort as well as significant heating and cooling savings, especially when combined with proper HVAC controls and adequate ventilation.

Perform Proper Lighting Maintenance

In order to sustain optimal lighting levels, lighting fixtures should undergo routine maintenance. Light levels decrease over time due to lamp aging, lamp and ballast failure, and buildup of dirt and dust on lamps, fixtures and reflective surfaces. Together, these factors can reduce total illumination by 20% - 60% or more, while operating fixtures continue drawing full power. To limit this reduction, lamps, reflectors and diffusers should be thoroughly cleaned of dirt, dust, oil, and smoke film buildup approximately every 6 – 12 months.

Develop a Lighting Maintenance Schedule

In addition to routine fixture cleaning, development of a maintenance schedule can both ensure maintenance is performed regularly and can reduce the overall cost of fixture re-lamping and re-ballasting. By re-lamping and re-ballasting fixtures in groups, lighting levels are better maintained and the number of site visits by a lighting technician or contractor can be minimized, decreasing the overall cost of maintenance.

Ensure Lighting Controls Are Operating Properly

Lighting controls are very cost effective energy efficient devices, when installed and operating correctly. As part of a lighting maintenance schedule, lighting controls should be tested annually to ensure proper functioning. For occupancy sensors, this requires triggering the sensor and verifying that the sensor's timer settings are correct. For daylight sensors, maintenance involves cleaning of sensor lenses and confirming setpoints and sensitivity are appropriately configured.

Turn Off Unneeded Motors

Electric motors often run unnecessarily, and this is an overlooked opportunity to save energy. These motors should be identified and turned off when appropriate. For example, exhaust fans often run unnecessarily when ventilation requirements are already met. Reducing run hours for these motors can result in significant energy savings. Whenever possible, use automatic devices such as twist timers or occupancy sensors to ensure that motors are turned off when not needed.

Perform Routine Motor Maintenance

Motors consist of many moving parts whose collective degradation can contribute to a significant loss of motor efficiency. In order to prevent damage to motor components, routine maintenance should be performed. This maintenance consists of cleaning surfaces and ventilation openings on motors to prevent overheating, lubricating moving parts to reduce friction, inspecting belts and pulleys for wear and to ensure they are at proper alignment and tension, and cleaning and lubricating bearings. Consult a licensed technician to assess these and other motor maintenance strategies.

Practice Proper Use of Thermostat Schedules and Temperature Resets

Ensure thermostats are correctly set back. By employing proper set back temperatures and schedules, facility heating and cooling costs can be reduced dramatically during periods of low or no occupancy. As such, thermostats should be programmed for a setback of 5-10°F during low occupancy hours (reduce heating setpoints and increase cooling setpoints). Cooling load can be reduced further by increasing the facility's occupied setpoint temperature. In general, during the cooling season, thermostats should be set as high as possible without sacrificing occupant comfort.

Ensure Economizers are Functioning Properly

Economizers, when properly configured, can be used to significantly reduce mechanical cooling. However, if the outdoor thermostat or enthalpy control is malfunctioning or the damper is stuck or improperly adjusted, benefits from the economizer may not be fully realized. As such, periodic inspection and maintenance is required to ensure proper operation. This maintenance should be scheduled with maintenance of the facility's air conditioning system and should include proper setting of the outdoor thermostat/enthalpy control, inspection of control and damper operation, lubrication of damper connections, and adjustment of minimum damper position. A malfunctioning economizer can significantly increase the amount of heating and mechanical cooling required by introducing excess amounts of cold or hot outside air.

Clean Evaporator/Condenser Coils on AC Systems

Dirty evaporators and condensers coils cause a restriction to air flow and restrict heat transfer. This results in increased evaporator and condenser fan load and a decrease in cooling system performance. Keeping the coils clean allows the fans and cooling system to operate more efficiently.

Clean and/or Replace HVAC Filters

Air filters work to reduce the amount of indoor air pollution and increase occupant comfort. Over time, filters become less and less effective as particulate buildup increases. In addition to health concerns related to clogged filters, filters that have reached saturation also restrict air flow through the facility's air conditioning or heat pump system, increasing the load on the distribution fans and decreasing occupant comfort levels. Filters should be checked monthly and cleaned or replaced when appropriate.

Check for and Seal Duct Leakage

Duct leakage in commercial buildings typically accounts for 5% to 25% of the supply airflow. In the case of rooftop air handlers, duct leakage can occur to the outside of the building, significantly increasing cooling and heating costs. By sealing sources of leakage, cooling, heating, and ventilation energy use can be reduced significantly, depending on the severity of air leakage.

Perform Proper Boiler Maintenance

Many boiler problems develop slowly over time, so regular inspection and maintenance is essential to retain proper functionality and efficiency of the heating system. Fuel burning equipment should undergo yearly tune-ups to ensure they are operating as safely and efficiently as possible from a combustion standpoint. A tune-up should include a combustion analysis to analyze the exhaust from the boilers and to ensure the boiler is operating safely. Buildup of dirt, dust, or deposits on the internal surfaces of a boiler can greatly affect its heat transfer efficiency. These deposits can accumulate on the water side or fire side of the boiler. Boilers should be cleaned regularly according to the manufacturer's instructions to remove this build up in order to sustain efficiency and equipment life.

Perform Proper Water Heater Maintenance

At least once a year, drain a few gallons out of the water heater using the drain valve. If there is a lot of sediment or debris, then a full flush is recommended. Turn the temperature down and then completely drain the tank. Once a year check for any leaks or heavy corrosion on the pipes and valves. For gas water heaters, check the draft hood and make sure it is placed properly, with a few inches of air space between the tank and where it connects to the vent. Look for any corrosion or wear on the gas line and on the piping. If you noticed any black residue, soot or charred metal, this is a sign you may be having combustion issues and you should have the unit serviced by a professional. For electric water heaters, look for any signs of leaking such as rust streaks or residue around the upper and lower panels covering the electrical components on the tank. For water heaters over three to four years old have a technician inspect the sacrificial anode annually.

Plug Load Controls

There are a variety of ways to limit the energy use of plug loads including increasing occupant awareness, removing under-utilized equipment, installing hardware controls, and using software controls. Some control steps to take are to enable the most aggressive power settings on existing devices or install load sensing or occupancy sensing (advanced) power strips. For additional information refer to "Plug Load Best Practices Guide" http://www.advancedbuildings.net/plug-load-best-practices-guide-offices.

Water Conservation

Installing low-flow faucets or faucet aerators, low-flow showerheads, and kitchen sink pre-rinse spray valves saves both energy and water. These devices save energy by reducing the overall amount of hot water used hence reducing the energy used to heat the water. The flow ratings for EPA WaterSense™ (http://www3.epa.gov/watersense/products) labeled devices are 1.5 gpm for bathroom faucets, 2.0 gpm for showerheads, and 1.28 gpm for pre-rinse spray valves.

Installing dual flush or low-flow toilets and low-flow or waterless urinals are additional ways to reduce the sites water use, however, these devices do not provide energy savings at the site level. Any reduction in water use does however ultimately reduce grid level electricity use since a significant amount of electricity is used to deliver water from reservoirs to end users. The EPA WaterSense™ ratings for urinals is 0.5 gallons per flush (gpf) and toilets that use as little as 1.28 gpf (this is lower than the current 1.6 gpf federal standard).

Refer to Section 4.1.4 for any low-flow ECM recommendations.

6 On-Site Generation Measures

On-site generation measure options include both renewable (e.g., solar, wind) and non-renewable (e.g., fuel cells) on-site technologies that generate power to meet all or a portion of the electric energy needs of a facility, often repurposing any waste heat where applicable. Also referred to as distributed generation, these systems contribute to Greenhouse Gas (GHG) emission reductions, demand reductions and reduced customer electricity purchases, resulting in the electric system reliability through improved transmission and distribution system utilization.

The State of New Jersey's Energy Master Plan (EMP) encourages new distributed generation of all forms and specifically focuses on expanding use of combined heat and power (CHP) by reducing financial, regulatory and technical barriers and identifying opportunities for new entries. The EMP also outlines a goal of 70% of the State's electrical needs to be met by renewable sources by 2050.

Preliminary screenings were performed to determine the potential that a generation project could provide a cost-effective solution for your facility. Before making a decision to implement, a feasibility study should be conducted that would take a detailed look at existing energy profiles, siting, interconnection, and the costs associated with the generation project including interconnection costs, departing load charges, and any additional special facilities charges.

6.1 Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV) modules. Modules are racked together into an array that produces direct current (DC) electricity. The DC current is converted to alternating current (AC) through an inverter. The inverter is interconnected to the facility's electrical distribution system. The amount of unobstructed area available determines how large of a solar array can be installed. The size of the array combined with the orientation, tilt, and shading elements determines the energy produced.

A preliminary screening based on the facility's electric demand, size and location of free area, and shading elements shows that the facility has a High potential for installing a PV array.

Brick Township Board of Education had on-going installations of solar energy projects at several schools during the time of site visits. According to PV-Watts1 (online solar calculator of the US Dept. of Energy) the building has sufficient unshaded rooftop space available to accommodate a solar array of about 80 kW of solar generating capacity. TRC estimates that installing the 80 kW PV array, would generate about 85,896 kWh per year. Such an array would offset about 46% the facility's annual electric needs. As mentioned in Section 1.2, this evaluation was conducted as part of the LGEA Program's scope of audit services. The analysis is a high-level approach to help identify sites that may have potential for installing PV arrays and does not take into account additional factors that may need to be addressed before installation (e.g. roof's ability to support array, etc.).

The amount of free area, ease of installation (location), and the lack of shading elements contribute to the high potential for PV at the site. If Herbertsville Elementary School is interested in pursuing the installation of PV, we recommended a full feasibility study be conducted. An image of the available roof space is shown below. The estimated costs and savings for such an installations are shown in the Figure 21 below.

http://pvwatts.nrel.gov/pvwatts.php

Figure 22 - Photovoltaic Screening

We estimate that the proposed array would pay for itself in about 9.2 years.

Solar projects must register their projects in the SREC Registration Program prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about developed new solar projects and insight into future SREC pricing. Refer to Section 8.3 for additional information.

For more information on solar PV technology and commercial solar markets in New Jersey, or to find a qualified solar installer, who can provide a more detailed assessment of the specific costs and benefits of solar develop of the site, please visit the following links below:

- **Basic Info on Solar PV in NJ**: http://www.njcleanenergy.com/whysolar
- **NJ Solar Market FAQs**: http://www.njcleanenergy.com/renewable-energy/program-updates-and-background-information/solar-transition/solar-market-faqs
- **Approved Solar Installers in the NJ Market**: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/?id=60&start=1

6.2 Combined Heat and Power

Combined heat and power (CHP) is the on-site generation of electricity along with the recovery of heat energy, which is put to beneficial use. Common technologies for CHP include reciprocating engines, microturbines, fuel cells, backpressure steam turbines, and (at large facilities) gas turbines. Electric generation from a CHP system is typically interconnected to local power distribution systems. Heat is recovered from exhaust and ancillary cooling systems and interconnected to the existing hot water (or steam) distribution systems.

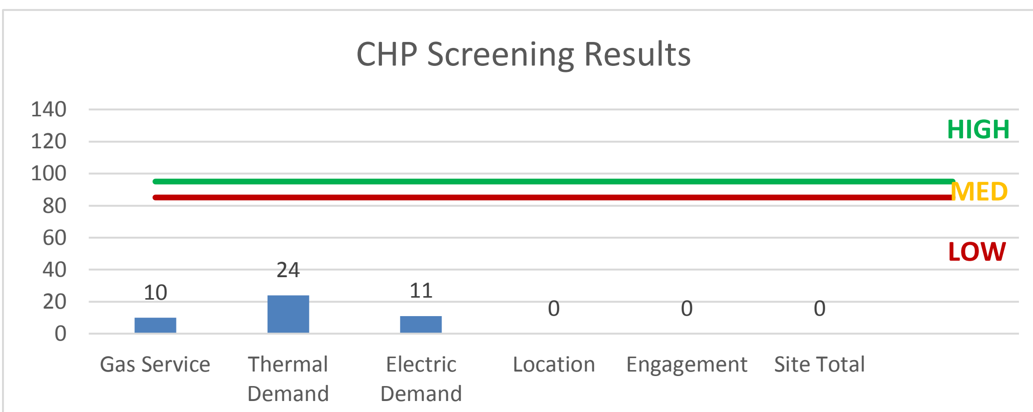
CHP systems are typically used to produce a portion of the electric power used onsite by a facility, with the balance of electric power needs supplied by grid purchases. The heat is used to supplement (or supplant) existing boilers for the purpose of space heating and/or domestic hot water heating. Waste heat can also be routed through absorption chillers for the purpose of space cooling. The key criteria used for screening, however, is the amount of time the system operates at full load and the facility's ability to use the recovered heat. Facilities with continuous use for large quantities of waste heat are the best candidates for CHP.

A preliminary screening based on heating and electrical demand, siting, and interconnection shows that the facility has a Low potential for installing a cost-effective CHP system.

Low or infrequent thermal load, and lack of space near the existing boilers are the most significant factors contributing to the low potential for CHP at the site. In our opinion, the facility does not appear to meet the minimum requirements for a cost-effective CHP installation.

For a list of qualified firms in New Jersey specializing in commercial CHP cost assessment and installation, go to: http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/tools-and-resources/tradeally/approved_vendorsearch/.

Figure 23 - Combined Heat and Power Screening



7 Demand Response

Demand Response (DR) is a program designed to reduce the electric load of commercial facilities when electric wholesale prices are high or when the reliability of the electric grid is threatened due to peak demand. Demand Response service providers (a.k.a. Curtailment Service Providers) are registered with PJM, the independent system operator (ISO) for mid-Atlantic state region that is charged with maintaining electric grid reliability.

By enabling grid operators to call upon Curtailment Service Providers and commercial facilities to reduce electric usage during times of peak demand, the grid is made more reliable and overall transmission costs are reduced for all ratepayers. Curtailment Service Providers provide regular payments to medium and large consumers of electric power for their participation in DR programs. Program participation is voluntary and participants receive payments whether or not their facility is called upon to curtail their electric usage.

Typically an electric customer needs to be capable of reducing their electric demand, within minutes, by at least 100 kW or more in order to participate in a DR program. Customers with a greater capability to quickly curtail their demand during peak hours will receive higher payments. Customers with back-up generators onsite may also receive additional DR payments for their generating capacity if they agree to run the generators for grid support when called upon. Eligible customers who have chosen to participate in a DR programs often find it to be a valuable source of revenue for their facility because the payments can significantly offset annual electric costs.

Participating customers can often quickly reduce their peak load through simple measures, such as temporarily raising temperature set points on thermostats, so that air conditioning units run less frequently, or agreeing to dim or shut off less critical lighting. This usually requires some level of building automation and controls capability to ensure rapid load reduction during a DR curtailment event. DR program participants may need to install smart meters or may need to also sub-meter larger energy-using equipment, such as chillers, in order to demonstrate compliance with DR program requirements.

DR does not include the reduction of electricity consumption based on normal operating practice or behavior. For example, if a company's normal schedule is to close for a holiday, the reduction of electricity due to this closure or scaled-back operation is not considered a demand response activity in most situations.

The first step toward participation in a DR program is to contact a Curtailment Service Provider. A list of these providers is available on PJM's website and it includes contact information for each company, as well as the states where they have active business (http://www.pjm.com/markets-and-operations/demand-response/csps.aspx). PJM also posts training materials that are developed for program members interested in specific rules and requirements regarding DR activity (http://www.pjm.com/training/training%20material.aspx), along with a variety of other DR program information.

Curtailment Service Providers typically offer free assessments to determine a facility's eligibility to participate in a DR program. They will provide details regarding program rules and requirements for metering and controls, assess a facility's ability to temporarily reduce electric load, and provide details on payments to be expected for participation in the program. Providers usually offer multiple options for DR to larger facilities and may also install controls or remote monitoring equipment of their own to help ensure compliance with all terms and conditions of a DR contract.

In our opinion Herbertsville Elementary School is not a good candidate for DR due to the limited loads that could be shed.

8 PROJECT FUNDING / INCENTIVES

The NJCEP is able to provide the incentive programs described below, and other benefits to ratepayers, because of the Societal Benefits Charge (SBC) Fund. The SBC was created by the State of New Jersey's Electricity Restructuring Law (1999), which requires all customers of investor-owned electric and gas utilities to pay a surcharge on their monthly energy bills. As a customer of a state-regulated electric or gas utility and therefore a contributor to the fund your organization is eligible to participate in the LGEA program and also eligible to receive incentive payment for qualifying energy efficiency measures. Also available through the NJBPU are some alternative financing programs described later in this section. Please refer to Figure 24 for a list of the eligible programs identified for each recommended ECM.

Figure 24 - ECM Incentive Program Eligibility

Energy Conservation Measure		SmartStart Prescriptive	SmartStart Custom	Direct Install	Pay For Performance Existing Buildings	Large Energy Users Program	Combined Heat & Power and Fuel Cell
ECM 1	Install LED Fixtures	X		X			
ECM 2	Retrofit Fixtures with LED Lamps	X		X			
ECM 3	Install LED Exit Signs			X			
ECM 4	Install Occupancy Sensor Lighting Controls	X		X			
ECM 5	Install High/Low Lighitng Controls						
ECM 6	Premium Efficiency Motors			X			
ECM 7	Install Low-Flow Domestic Hot Water Devices			X			

SmartStart is generally well-suited for implementation of individual measures or small group of measures. It provides flexibility to install measures at your own pace using in-house staff or a preferred contractor. Direct Install caters to small to mid-size facilities that can bundle multiple ECMs together. This can greatly simplify participation and may lead to higher incentive amounts, but requires the use of pre-approved contractors. Generally, the incentive values provided throughout the report assume the SmartStart program is utilized because it provides a consistent basis for comparison of available incentives for various measures, though in many cases incentive amounts may be higher through participation in other programs.

Brief descriptions of all relevant financing and incentive programs are located in the sections below. Further information, including most current program availability, requirements, and incentive levels can be found at: www.njcleanenergy.com/ci.

8.1 SmartStart

Overview

The SmartStart program offers incentives for installing prescriptive and custom energy efficiency measures at your facility. Routinely the program adds, removes or modifies incentives from year to year for various energy efficiency equipment based on market trends and new technologies.

Equipment with Prescriptive Incentives Currently Available:

Electric Chillers
Electric Unitary HVAC
Gas Cooling
Gas Heating
Gas Water Heating
Ground Source Heat Pumps
Lighting
Lighting Controls
Refrigeration Doors
Refrigeration Controls
Refrigerator/Freezer Motors
Food Service Equipment
Variable Frequency Drives

Most equipment sizes and types are served by this program. This program provides an effective mechanism for securing incentives for energy efficiency measures installed individually or as part of a package of energy upgrades.

Incentives

The SmartStart prescriptive incentive program provides fixed incentives for specific energy efficiency measures, whereas the custom SmartStart program provides incentives for more unique or specialized technologies or systems that are not addressed through prescriptive incentive offerings for specific devices.

Since your facility is an existing building, only the retrofit incentives have been applied in this report. Custom Measure incentives are calculated at $0.16/kWh and $1.60/therm based on estimated annual savings, capped at 50% of the total installed incremental project cost, or a project cost buy down to a one year payback (whichever is less. Program incentives are capped at $500,000 per electric account and $500,000 per natural gas account, per fiscal year.

How to Participate

To participate in the SmartStart program you will need to submit an application for the specific equipment to be installed. Many applications are designed as rebates, although others require application approval prior to installation. Applicants may work with a contractor of their choosing and can also utilize internal personnel, which provides added flexibility to the program. Using internal personnel also helps improve the economics of the ECM by reducing the labor cost that is included in the tables in this report.

Detailed program descriptions, instructions for applying and applications can be found at: www.njcleanenergy.com/SSB.

8.2 Direct Install

Overview

Direct Install is a turnkey program available to existing small to medium-sized facilities with a peak electric demand that does not exceed 200 kW for a recent 12-month period. You will work directly with a pre-approved contractor who will perform a free energy assessment at your facility, identify specific eligible measures, and provide a clear scope of work for installation of selected measures. Energy efficiency measures may include lighting and lighting controls, refrigeration, HVAC, motors, variable speed drives and controls.

Incentives

The program pays up to 70% of the total installed cost of eligible measures, up to $125,000 per project. Direct Install participants will also be held to a fiscal year cap of $250,000 per entity.

How to Participate

To participate in the Direct Install program you will need to contact the participating contractor who the region of the state where your facility is located. A complete list of Direct Install program partners is provided on the Direct Install website linked below. The contractor will be paid the measure incentives directly by the program which will pass on to you in the form of reduced material and implementation costs. This means up to 70% of eligible costs are covered by the program, subject to program caps and eligibility, while the remaining 30% of the cost is paid to the contractor by the customer.

Since Direct Install offers a free assessment of eligible measures, Direct Install is also available to small businesses and other commercial facilities too that may not be eligible for the more detailed facility audits provided by LGEA.

Detailed program descriptions and applications can be found at: www.njcleanenergy.com/DI.

8.3 SREC Registration Program

The SREC (Solar Renewable Energy Certificate) Registration Program (SRP) is used to register the intent to install solar projects in New Jersey. Rebates are not available for solar projects, but owners of solar projects MUST register their projects in the SRP prior to the start of construction in order to establish the project's eligibility to earn SRECs. Registration of the intent to participate in New Jersey's solar marketplace provides market participants with information about the pipeline of anticipated new solar capacity and insight into future SREC pricing.

After the registration is accepted, construction is complete, and final paperwork has been submitted and is deemed complete, the project is issued a New Jersey certification number which enables it to generate New Jersey SRECs. SREC's are generated once the solar project has been authorized to be energized by the Electric Distribution Company (EDC).

Each time a solar installation generates 1,000 kilowatt-hours (kWh) of electricity, an SREC is earned. Solar project owners report the energy production to the SREC Tracking System. This reporting allows SREC's to be placed in the customer's electronic account. SRECs can then be sold on the SREC Tracking System, providing revenue for the first 15 years of the project's life.

Electricity suppliers, the primary purchasers of SRECs, are required to pay a Solar Alternative Compliance Payment (SACP) if they do not meet the requirements of New Jersey's Solar RPS. One way they can meet the RPS requirements is by purchasing SRECs. As SRECs are traded in a competitive market, the price may vary significantly. The actual price of an SREC during a trading period can and will fluctuate depending on supply and demand.

Information about the SRP can be found at: www.njcleanenergy.com/srec.

8.4 Energy Savings Improvement Program

The Energy Savings Improvement Program (ESIP) is an alternate method for New Jersey's government agencies to finance the implementation of energy conservation measures. An ESIP is a type of "performance contract," whereby school districts, counties, municipalities, housing authorities and other public and state entities enter in to contracts to help finance building energy upgrades. This is done in a manner that ensures that annual payments are lower than the savings projected from the ECMs, ensuring that ESIP projects are cash flow positive in year one, and every year thereafter. ESIP provides government agencies in New Jersey with a flexible tool to improve and reduce energy usage with minimal expenditure of new financial resources. NJCEP incentive programs can be leveraged to help further reduce the total project cost of eligible measures.

This LGEA report is the first step to participating in ESIP. Next, you will need to select an approach for implementing the desired ECMs:

(1) Use an Energy Services Company or "ESCO."
(2) Use independent engineers and other specialists, or your own qualified staff, to provide and manage the requirements of the program through bonds or lease obligations;
(3) Use a hybrid approach of the two options described above where the ESCO is utilized for some services and independent engineers, or other specialists or qualified staff, are used to deliver other requirements of the program.

After adopting a resolution with a chosen implementation approach, the development of the Energy Savings Plan (ESP) can begin. The ESP demonstrates that the total project costs of the ECMs are offset by the energy savings over the financing term, not to exceed 15 years. The verified savings will then be used to pay for the financing.

The ESIP approach may not be appropriate for all energy conservation and energy efficiency improvements. Entities should carefully consider all alternatives to develop an approach that best meets their needs. A detailed program descriptions and application can be found at: www.njcleanenergy.com/ESIP.

Please note that ESIP is a program delivered directly by the NJBPU and is not an NJCEP incentive program. As mentioned above, you may utilize NJCEP incentive programs to help further reduce costs when developing the ESP. You should refer to the ESIP guidelines at the link above for further information and guidance on next steps.

9 ENERGY PURCHASING AND PROCUREMENT STRATEGIES

9.1 Retail Electric Supply Options

In 1999, New Jersey State Legislature passed the Electric Discount & Energy Competition Act (EDECA) to restructure the electric power industry in New Jersey. This law deregulated the retail electric markets, allowing all consumers to shop for service from competitive electric suppliers. The intent was to create a more competitive market for electric power supply in New Jersey. As a result, utilities were allowed to charge Cost of Service and customers were given the ability to choose a third party (i.e. non-utility) energy supplier.

Energy deregulation in New Jersey has increased energy buyers' options by separating the function of electricity distribution from that of electricity supply. So, though you may choose a different company from which to buy your electric power, responsibility for your facility's interconnection to the grid and repair to local power distribution will still reside with the traditional utility company serving your region.

If your facility is not purchasing electricity from a third party supplier, consider shopping for a reduced rate from third party electric suppliers. If your facility is purchasing electricity from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party electric suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

9.2 Retail Natural Gas Supply Options

The natural gas market in New Jersey has also been deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. The utility provides basic gas supply service (BGSS) to customers who choose not to buy from a third party supplier for natural gas commodity.

A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by signing up for service through a third party retail natural gas supplier. Many larger natural gas customers may seek the assistance of a professional consultant to assist in their procurement process.

If your facility is not purchasing natural gas from a third party supplier, consider shopping for a reduced rate from third party natural gas suppliers. If your facility is purchasing natural gas from a third party supplier, review and compare prices at the end of the current contract or every couple years.

A list of third party natural gas suppliers, who are licensed by the state to provide service in New Jersey, can be found online at: www.state.nj.us/bpu/commercial/shopping.html.

Appendix A: Equipment Inventory & Recommendations

Lighting Inventory & Recommendations

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.13	601	0.0	$73.89	$351.00	$60.00	3.94
Boiler Room 1	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 2	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.04	200	0.0	$24.63	$117.00	$20.00	3.94
Gymnasium	12	Linear Fluorescent - T5: 4' T5 (28W) - 4L	Wall Switch	120	2,640	Relamp	Yes	12	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,848	0.62	2,893	0.0	$355.58	$1,681.60	$310.00	3.86
Gymnasium	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	1	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Gymnasium	1	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	$9.91	$107.56	$0.00	10.86
Gym Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,848	0.08	380	0.0	$46.69	$291.50	$50.00	5.17
Kitchen	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	No	12	LED - Linear Tubes: (3) 4' Lamps	Wall Switch	44	2,640	0.39	1,803	0.0	$221.68	$902.40	$180.00	3.26
Kitchen	2	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	2	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	161	0.0	$19.81	$215.11	$0.00	10.86
Teacher Room	6	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	6	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.25	1,139	0.0	$140.06	$567.20	$110.00	3.26
Adult Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	1	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,848	0.03	127	0.0	$15.56	$174.50	$30.00	9.29
Boys Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,848	0.08	380	0.0	$46.69	$291.50	$30.00	5.60
Girls Restroom	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,848	0.08	380	0.0	$46.69	$291.50	$30.00	5.60
New Section Corridor	3	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	3	LED Exit Signs: 2 W Lamp	None	6	8,760	0.02	242	0.0	$29.72	$322.67	$0.00	10.86
New Section Corridor	11	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	11	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,848	0.30	1,393	0.0	$171.19	$843.50	$110.00	4.28
Entrance 8A	6	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	6	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.13	601	0.0	$73.89	$351.00	$60.00	3.94
Entrance 8A	1	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	1	LED Exit Signs: 2 W Lamp	None	6	8,760	0.01	81	0.0	$9.91	$107.56	$0.00	10.86
Room 12	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.57	2,659	0.0	$326.81	$1,168.80	$230.00	2.87
Room 12	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.02	100	0.0	$12.32	$58.50	$10.00	3.94
Room 12	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,640	0.02	88	0.0	$10.82	$63.20	$0.00	5.84
Room 14	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.57	2,659	0.0	$326.81	$1,168.80	$230.00	2.87
Room 14	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.02	100	0.0	$12.32	$58.50	$10.00	3.94
Room 14	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,640	0.02	88	0.0	$10.82	$63.20	$0.00	5.84
Room 15	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.57	2,659	0.0	$326.81	$1,168.80	$230.00	2.87
Room 15	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.02	100	0.0	$12.32	$58.50	$10.00	3.94

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 15	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,640	0.02	88	0.0	$10.82	$63.20	$0.00	5.84
Room 11	14	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	14	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.57	2,659	0.0	$326.81	$1,168.80	$230.00	2.87
Room 11	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.02	100	0.0	$12.32	$58.50	$10.00	3.94
Room 11	1	U-Bend Fluorescent - T8: U T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) U-Lamp	Wall Switch	33	2,640	0.02	88	0.0	$10.82	$63.20	$0.00	5.84
Custodian Closet	1	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	No	1	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,640	0.01	53	0.0	$6.53	$35.90	$5.00	4.73
Girls Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.04	200	0.0	$24.63	$117.00	$20.00	3.94
Boys Restroom	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.04	200	0.0	$24.63	$117.00	$20.00	3.94
Room 1	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77
Room 2	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.23	1,061	0.0	$130.47	$690.40	$100.00	4.53
Restroom	1	Compact Fluorescent: 23W Screen-in CFL	Wall Switch	23	2,640	Relamp	No	1	LED Screw-In Lamps: LED screw in	Wall Switch	9	2,640	0.01	43	0.0	$5.22	$53.75	$0.00	10.29
Old Section Corridor	5	Exit Signs: Incandescent	None	14	8,760	Fixture Replacement	No	5	LED Exit Signs: 2 W Lamp	None	6	8,760	0.03	403	0.0	$49.53	$537.78	$0.00	10.86
Old Section Corridor	17	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	17	LED - Linear Tubes: (2) 4' Lamps	High/Low Control	29	1,848	0.46	2,152	0.0	$264.56	$1,194.50	$170.00	3.87
Room 10	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77
Room 3	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.23	1,061	0.0	$130.47	$690.40	$100.00	4.53
Room 9	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77
Room 8	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.23	1,061	0.0	$130.47	$690.40	$100.00	4.53
Room 7	16	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	16	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.23	1,061	0.0	$130.47	$690.40	$100.00	4.53
Room 7,8	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	None	No	2	Exit Signs: LED - 2 W Lamp	None	6	8,760	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Child Study Room	4	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	4	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.16	760	0.0	$93.37	$416.80	$80.00	3.61
Speech Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	3	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.10	472	0.0	$58.05	$223.70	$35.00	3.25
Copy Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	3	LED - Linear Tubes: (1) 4' Lamp	Wall Switch	15	2,640	0.09	433	0.0	$53.18	$107.70	$15.00	1.74
Copy Room	3	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	3	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.12	570	0.0	$70.03	$341.60	$65.00	3.95
Boys Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,640	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,640	0.04	170	0.0	$20.90	$95.13	$20.00	3.60
Girls Restroom	1	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,640	Relamp	No	1	LED - Linear Tubes: (4) 4' Lamps	Wall Switch	58	2,640	0.04	170	0.0	$20.90	$95.13	$20.00	3.60
Room 4	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77

	Existing Conditions					Proposed Conditions							Energy Impact & Financial Analysis						
Location	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Fixture Recommendation	Add Controls?	Fixture Quantity	Fixture Description	Control System	Watts per Fixture	Annual Operating Hours	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 5	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77
Room 6	12	Linear Fluorescent - T8: 4' T8 (32W) - 1L	Wall Switch	32	2,640	Relamp	Yes	12	LED - Linear Tubes: (1) 4' Lamp	Occupancy Sensor	15	1,848	0.17	796	0.0	$97.85	$546.80	$80.00	4.77
Storage Room	1	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	1	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.02	100	0.0	$12.32	$58.50	$10.00	3.94
Corridor	2	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	No	2	LED - Linear Tubes: (2) 4' Lamps	Wall Switch	29	2,640	0.04	200	0.0	$24.63	$117.00	$20.00	3.94
Principal Office	3	Linear Fluorescent - T8: 4' T8 (32W) - 2L	Wall Switch	62	2,640	Relamp	Yes	3	LED - Linear Tubes: (2) 4' Lamps	Occupancy Sensor	29	1,848	0.08	380	0.0	$46.69	$291.50	$50.00	5.17
Library	15	Linear Fluorescent - T8: 4' T8 (32W) - 4L	Wall Switch	114	2,640	Relamp	Yes	15	LED - Linear Tubes: (4) 4' Lamps	Occupancy Sensor	58	1,848	0.72	3,343	0.0	$410.89	$1,543.00	$320.00	2.98
Room 16	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.49	2,279	0.0	$280.12	$1,018.40	$200.00	2.92
Room 17	12	Linear Fluorescent - T8: 4' T8 (32W) - 3L	Wall Switch	93	2,640	Relamp	Yes	12	LED - Linear Tubes: (3) 4' Lamps	Occupancy Sensor	44	1,848	0.49	2,279	0.0	$280.12	$1,018.40	$200.00	2.92
Exterior Perimeter Light	13	Metal Halide: (1) 250W Lamp	Daylight Dimming	295	4,380	Fixture Replacement	No	13	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	55	4,380	2.05	15,715	0.0	$1,931.81	$5,078.80	$1,300.00	1.96
Exit 8A	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	9	4,380	None	No	2	LED - Fixtures: Outdoor Wall-Mounted Area Fixture	Daylight Dimming	9	4,380	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Motor Inventory & Recommendations

Location	Area(s)/System(s) Served	Existing Conditions: Motor Quantity	Motor Application	HP Per Motor	Full Load Efficiency	VFD Control?	Annual Operating Hours	Proposed Conditions: Install High Efficiency Motors?	Full Load Efficiency	Install VFDs?	Number of VFDs	Energy Impact & Financial Analysis: Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	School Building - Old Section	2	Heating Hot Water Pump	1.0	88.0%	No	1,500	No	88.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 1	Compressor	1	Air Compressor	0.5	78.0%	No	910	No	78.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 2	School Building - New Section	1	Heating Hot Water Pump	2.0	68.0%	No	1,500	Yes	86.5%	No		0.26	528	0.0	$64.89	$532.17	$0.00	8.20
Roof Top	Restroom	2	Exhaust Fan	0.5	65.0%	No	2,040	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Corridor	3	Exhaust Fan	0.5	65.0%	No	2,040	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Corridor	1	Exhaust Fan	0.3	65.0%	No	2,040	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
School	School	49	Other	0.5	65.0%	No	1,300	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Above the Ceiling	2002 Addition Hot Water Sysrem	2	Heating Hot Water Pump	0.8	65.0%	No	1,500	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Supply Fan	0.5	65.0%	No	2,160	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Supply Fan	7.5	86.0%	No	2,160	No	86.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Supply Fan	0.5	65.0%	No	2,160	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Other	0.3	65.0%	No	2,160	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Supply Fan	0.5	65.0%	No	2,160	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	RTU	1	Other	0.3	65.0%	No	2,160	No	65.0%	No		0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Electric HVAC Inventory & Recommendations

		Existing Conditions				Proposed Conditions								Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Install High Efficiency System?	System Quantity	System Type	Cooling Capacity per Unit (Tons)	Heating Capacity per Unit (kBtu/hr)	Cooling Mode Efficiency (SEER/EER)	Heating Mode Efficiency (COP)	Install Dual Enthalpy Economizer?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Room 12	Room 12	1	Ductless Mini-Split HP	2.00	23.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 14	Room 14	1	Ductless Mini-Split HP	2.00	23.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 15	Room 15	1	Ductless Mini-Split HP	2.00	23.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 11	Room 11	1	Ductless Mini-Split HP	2.00	23.00	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 1	Room 1	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 3	Room 3	1	Window AC	1.50		Yes	1	Window AC	1.50		12.00		No	0.85	1,269	0.0	$156.02	$1,633.14	$0.00	10.47
Room 9	Room 9	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Room 4	Room 4	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Principal Office	Principal Office	1	Window AC	2.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Kitchen	1	Packaged Air-Source HP	3.00	25.50	No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Cafeteria	2	Packaged AC	15.00		No							No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Speech Room	1	Packaged AC	3.00		Yes	1	Packaged AC	3.00		14.00		No	1.11	1,664	0.0	$204.53	$6,806.88	$276.00	31.93
Roof Top	Library	1	Packaged AC	5.00		Yes	1	Packaged AC	5.00		14.00		No	1.86	2,773	0.0	$340.88	$11,344.80	$460.00	31.93

Fuel Heating Inventory & Recommendations

		Existing Conditions			Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Output Capacity per Unit (MBh)	Install High Efficiency System?	System Quantity	System Type	Output Capacity per Unit (MBh)	Heating Efficiency	Heating Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	School's Old Section	2	Condensing Hot Water Boiler	467.00	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Boiler Room 2	1998 Addition	1	Non-Condensing Hot Water Boiler	960.00	Yes	1	Condensing Hot Water Boiler	960.00	91.00%	Et	0.00	0	77.7	$773.47	$23,043.29	$2,112.00	27.06
Roof Top	2002 Addition	1	Non-Condensing Hot Water Boiler	144.80	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Roof Top	Speech Room	1	Furnace	56.00	Yes	1	Furnace	56.00	95.00%	AFUE	0.00	0	5.5	$54.86	$1,268.81	$400.00	15.84
Roof Top	Library	1	Furnace	80.00	Yes	1	Furnace	80.00	95.00%	AFUE	0.00	0	7.9	$78.36	$1,812.59	$400.00	18.03

DHW Inventory & Recommendations

		Existing Conditions		Proposed Conditions						Energy Impact & Financial Analysis						
Location	Area(s)/System(s) Served	System Quantity	System Type	Replace?	System Quantity	System Type	Fuel Type	System Efficiency	Efficiency Units	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Boiler Room 1	School's Old Section	1	Storage Tank Water Heater (> 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00
boiler Room 2	Rooms 11,12,14,15	1	Storage Tank Water Heater (≤ 50 Gal)	No						0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Low-Flow Device Recommendations

	Recommedation Inputs				Energy Impact & Financial Analysis						
Location	Device Quantity	Device Type	Existing Flow Rate (gpm)	Proposed Flow Rate (gpm)	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	2	Faucet Aerator (Kitchen)	3.00	2.20	0.00	0	1.8	$17.91	$14.34	$0.00	0.80
School	13	Faucet Aerator (Lavatory)	2.00	1.00	0.00	0	14.6	$145.54	$93.21	$0.00	0.64

Commercial Refrigerator/Freezer Inventory & Recommendations

	Existing Conditions			Proposed Condi	Energy Impact & Financial Analysis						
Location	Quantity	Refrigerator/ Freezer Type	ENERGY STAR Qualified?	Install ENERGY STAR Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Stand-Up Refrigerator, Solid Door (31 - 50 cu. ft.)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	1	Refrigerator Chest	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Cooking Equipment Inventory & Recommendations

	Existing Conditions			Proposed Conditions	Energy Impact & Financial Analysis						
Location	Quantity	Equipment Type	High Efficiency Equipement?	Install High Efficiency Equipment?	Total Peak kW Savings	Total Annual kWh Savings	Total Annual MMBtu Savings	Total Annual Energy Cost Savings	Total Installation Cost	Total Incentives	Simple Payback w/ Incentives in Years
Kitchen	1	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00
Kitchen	2	Insulated Food Holding Cabinet (Full Size)	Yes	No	0.00	0	0.0	$0.00	$0.00	$0.00	0.00

Plug Load Inventory

	Existing Conditions			
Location	Quantity	Equipment Description	Energy Rate (W)	ENERGY STAR Qualified?
School	57	Desktop with LCD Monitor	191.0	Yes
School	4	Microwave	1,000.0	No
School	3	Refrigerator	258.0	Yes
School	1	Refrigerator	365.0	Yes
Boiler Room 2	1	Electric Heater	5,000.0	No
School	2	Coffee Machine	1,050.0	No
School	4	Small Printer	46.0	Yes
Copy Room	1	Copy Machine	1,400.0	Yes
School	97	Labtop Computer	45.0	Yes

Appendix B: ENERGY STAR® Statement of Energy Performance

Herbertsville Elementary School building was benchmarked along with the Annex building as they shared the total thermal load.

ENERGY STAR® Statement of Energy Performance

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28

ENERGY STAR® Score[1]

Herbertsville Elementary School

Primary Property Type: K-12 School
Gross Floor Area (ft²): 28,524
Built: 1949

For Year Ending: February 29, 2016
Date Generated: August 21, 2017

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address
Herbertsville Elementary School
2282 Lanes Mill Road
Brick, New Jersey 08724

Property Owner
Brick Township Board of Education
101 Hendrickson Avenue
Brick, NJ 08724
(732) 785-3000

Primary Contact
James Edwards
101 Hendrickson Avenue
Brick, NJ 08724
(732) 785-3000
jedwards@brickschools.org

Property ID: 6014920

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
93.6 kBtu/ft²

Source EUI
162.5 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,792,855 (67%)
Electric - Grid (kBtu)	876,932 (33%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	76.9
National Median Source EUI (kBtu/ft²)	133.5
% Diff from National Median Source EUI	22%

Annual Emissions

Greenhouse Gas Emissions (Metric Tons CO2e/year)	192

Signature & Stamp of Verifying Professional

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: ______________________Date: __________

Licensed Professional

____ ________
,
(____)____-______
____

Professional Engineer Stamp
(if applicable)